Claims

What is claimed is:

1. An interferometer comprising a beam splitter and combiner for splitting an input beam into two sub-beams and for combing two sub-beams into a single beam;
a first arm having a length l_1 optically coupled to the beam splitter and combiner, said first arm defining a first path within a first material having a refractive index n_1 and a coefficient of expansion α_1; and,
a second arm having a length l_2 optically coupled with the beam splitter and combiner, said second arm defining a second path within a second material having a refractive index n_2 and a coefficient of expansion α_2 wherein the lengths of the two arms are selected such that they satisfy the equation:

$$l_1\left[n_1\alpha_1+\frac{dn_1}{dT}\right]-l_2\left[n_2\alpha_2+\frac{dn_2}{dT}\right]=0\ .$$

2. An interferometer as defined in claim 1, wherein the interferometer is at least substantially athermal, and wherein the beam splitter and combiner is coupled to inner end faces of the first and second arm, in a Twyman-Green configuration.

3. An interferometer as defined in claim 2, wherein an outer end face of the first arm and an outer end face of the second arm are at least partially reflecting.

4. An interferometer as defined in claim 3 wherein a monitoring port is provided for receiving light transmitted through at least one of the two partially reflecting end faces.

5. An interferometer as defined in claim 4, wherein the beam splitter and combiner splits an input beam incident thereon into two substantially equal beams.

6. An interferometer as defined in claim 5 wherein the beam splitter and combiner spits light incident thereon into two beams disproportionately.

7. A at least substantially athermal bulk-optic interferometer comprising a beam splitter combiner for splitting an input beam provided at a input port into two sub-beams and for combining two sub-beams into a single interference beam directed to the beam combiner output port;

a first block of material defining a first arm having a length of substantially l_1 optically coupled to the beam splitter and combiner, said first arm defining a first path having a refractive index n_1 and a coefficient of expansion α_1; and,

a second block of material defining a second arm having a length substantially l_2 optically coupled with the beam splitter and combiner, said second arm defining a second path having a refractive index n_2 and a coefficient of expansion α_2,

wherein, n_1, n_2, α_1 and α_2 are predetermined, wherein the lengths l_1 and l_2 of the two arms are selected such that they satisfy the equation:

$$l_1\left[n_1\alpha_1 + \frac{dn_1}{dT}\right] - l_2\left[n_2\alpha_2 + \frac{dn_2}{dT}\right] = 0.$$

8. An at least substantially athermal interferometer as defined in claim 7, wherein a first end face of the first arm and a first end face of the second arm are directly coupled to the beam splitter and combiner and wherein a second end face of the first arm and a second end face of the second arm are at least partially reflective, such that a portion of the two sub-beams incident upon the end faces is reflected back to the beam splitter combiner.

9. A wavelocker for determining if an input beam is substantially locked in wavelength comprising:

an at least substantially athermal interferometer as defined in claim 8, having an output port at a second end of a second end face of the second block for receiving most of an input beam launched into the beam splitter and combiner.

10. A wavelocker as defined in claim 9 wherein the second end face of the first arm provides a port for power monitoring, and wherein the beam combiner output port provides a port for determining if a wavelength of the input beam has varied.

11. A wavelocker as defined in claim 10, wherein the end face of the second end face of the first arm is substantially reflective, and wherein the end face of the second end face of the second arm is substantially transmissive.

12. A wavelocker as defined in claim 11, wherein the beam splitter and combiner provides substantially more of the input signal to the second arm than to the first arm.

13. A substantially athermal interferometric wavelocker comprising:
a beam splitter combiner;
a first arm of a first material having a first refractive index, a first length, and a first coefficient of expansion; and,
a second arm of a second material having a second refractive index, a second length, and a second coefficient of expansion;
wherein the refractive indices, lengths and coefficients of expansion of the first arm and the second arm are selected to provide a substantially athermal structure operating at ambient temperatures,
the first arm and second arm having inner end faces that meet adjacent faces of the beam splitter and combiner, the first and second arms being of a different optical path length such that light launched into the beam splitter and combiner, interferes upon recombining, and is output from a combiner output port to provide a wavelocker signal having a detectable characteristic which varies with wavelength.

14. A substantially athermal interferometric wavelocker as defined in claim 13, further comprising means responsive to the wavelocker signal for detecting a variation in wavelength.

15. A substantially athermal wavelocker as defined in claim 14 wherein the beam splitting ratio of the beam splitter combiner, and the reflectivities of the outer end faces of the first arm and second arm are selected such that substantially most of the light launched into the beam splitter combiner is passed out of one of the outer end faces as an output signal, and such that a lesser portion of the light is utilized for wavelocking or power monitoring.

16. An interferometer as defined in claim 1, wherein the interferometer is at least substantially athermal and wherein the beam splitter and beam combiner are separate components, the interferometer forming a Mach Zehnder interferometer.

17. A wavelocker as defined in claim 1, wherein the sign of $[n_1\alpha_1+dn_1/dT]$ is equal to the sign of $[n_2\alpha_2+dn_2/dT]$.

18. A wavelocker as defined in claim 7, wherein the sign of $[n_1\alpha_1+dn_1/dT]$ is the same as the sign of $[n_2\alpha_2+dn_2/dT]$.